7301 U-007-307.42

MILLER, M. C., ET AL, ELECTROFISHING SURVEY OF THE GREAT MIAMI RIVER, ANNUAL REPORT, FERNALD ENVIRONMENTAL MANAGEMENT CO, CINCINNATI, OH - (USED AS A REFERENCE IN OU 5 RI REPORT)

09/15/88

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REPORT

FISH OF GREAT MIAMI RIVER 15-16 SEPT. 86

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FINAL REPORT: ELECTROFISHING SURVEY OF THE GREAT MIAMI RIVER

DATE: 15-16 September 1986

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INTRODUCTION:

This report is a companion to the electroshocking of the Great Miami River on 15-16 Sept. 1986, during which time samples were taken fro radionuclide analysis. Those samples were shipped to EAL, Inc. for analysis. All of the fish recovered were identified to species, weighed, and length taken. This report details those findings and analyses on the status of the Great Miami R. fishery from above to below the outfalls of the Westinghouse Materials Company of Ohio at Fernald.

METHODS:

Fish were electroshocked with 240 volt , pulsed DC (60 hz), 4 amp of delivered power from a 16 foot electrofishing boat. The boat used a forward anode of 4 vertical cables in the top 4" of water to attract the fish to the surface of the muddy river water. The cathode was long strands of cable mounted on the front of the boat. The electricity was provided by a 3500 Watt ONAN generator. The electricity was activated to the electrodes by a 'deadman' foot switch.

Each station was fished for 40-50 minutes as tabulated by the number of minutes the shocker was actually on (using the foot switch). The stunned fish were net by two bow persons and placed in a central well. Some large game fish were released. Othter species except for gizzard shad were taken in proportion to their abundance, with the reservation that small fish were probably underestimated in the sample.

The fish were identified, weighed, measured for length to the

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nearest 0.1 gm or cm. Verification of the identification of a particular fish was completed in the laboratory. using the appropriate keys (Trautman 1981. Fishes of Ohio, O.S.U. Press, Columbus and W.L. Pfleiger. 1975. The Fishes of Missouri. Missouri Dept. Conservation.) The fish were placed on ice in plastic bags and returned to the University of Cincinnati. In the afternoon of the day the fish were collected, they were cleaned for radionuclide analysis. In this procedure, the heads, tails and dorsal fins were removed. The viscera and swim bladder were removed. All fish were placed into plastic bags in quantities of 400-1000 gms, labelled as to station, species, and appoximate wet weight and frozen at -20C. The frozen fish were placed in styrofoam coolers with 10-13 lbs of dry ice, inventoried, and shipped to EAL, Inc., California for Uranium analysis. The inventory for each cooler(one cooler per station) was included in the shipment and one copy sent to Chris Aas.

RESULTS: The number of fish caught with more or less constant effort ranged from 74 at station #1, Boulton Waterworks pool, to 79 at station #2, the outfall from Westinghouse at Strickers grove, to 181 at station #3 below Paddy's Run at Welches Sand and Gravel(Fig.2). We shocked for 50 minutes at station #1, for 24 and 35 minutes at station #2 on 15 and 16 Sept., respectively, and for 40.9 minutes at station #3. The susceptibility of fish to shocking vary with the topography of the shore, the nature of pools and currents, and the amount of vegetation overhanging the river. Station #2 had little good habitat with low current velocity. Station #3 was disturbed by gravel removal operations however the diversity of fish were found on the undisturbed shore, not on the barren, shifting disturbed shore. Station #1 was good habitat with simply lowered diversity. Some effluents from the water treatment plant were seen, creating a delta of alum used to sediment silt in water treatment. At the three stations from upstream to downstream 12, 15, and 16 species were collected, respectively (Fig. 1).

The diversity of fish based upon the numbers recovered, relatively nonselectively was measured by information theory based methods using log base 2. The greater index of diversity is increased by the number of species in a sample and the relative uniformity of the numbers of fish in each of the component species. The maximal diversity that can be attained by in any sample with a fixed number of species is dependent only the number of species (Table 1). The maximal diversity increases at each station downstream as do the number of species in the sample. The index of diversity is highest at station #2(3.5) and lowest at station #3(2.2) (Fig. 2). Since station #3 had the greatest number of species and highest possible diversity if all species were represented by equal numbers of individuals, the actual diversity must be lowered by one species being a vast numerical dominant. That species was the gizzard shad moving up the river from the Ohio River, trapped near Paddy's Run confluence by a permanent dam built upriver 0.5 miles to protect a gas pipeline crossing the river. Station #2 had the highest diversity eventhough the total number of fish collected here was small. The eveness between population numbers of each species was very constant. The eveness coefficient of actual divided by potential diversity with a given species richness shows the high eveness at statlion #2 and the low eveness at station #3 (Table 1). Station #1 was intermediate.

We examined the length and weight frequency diagrams for the total catch at each station. Clearly station #3 had a modal peak by length and by weight(Fig. 4 a and 4 b., respectively). This was probably 2nd year gizzard shad(200-280 mm, or 100-140 gm). The modes for station 1 and 2 were for much smaller fish (1 year olds). When the length and weight frquency diagrams are reploted on a percentage basis there were both more large old fish and young fish at stations #1 and #2 than at station #3 (Fig. 5a and 5b, respectively). Plotted as the cumulative percent frequency by length and weight the differences are more clear. Station #1 had the highest contribution of large fish, greater than 2 and 3. Station #2 had the highest proportion of small fish(< 100gm or 200 mm). Station #3 had large numbers of intermediate sized fish.

What caused the increase in 2-3 year old gizzard shad at station #3 may have been the concentration of large predators at this station that could have eliminated small fish. Large mouth bass(16), white bass(7), sauger (1), and white and black crappie(3 of each) constituted the largest number and proportion of predators at any station. These predators could have significantly reduced the survival of young of the year and year 1 fish in the Paddy's Run pool blocked by the upstream dam.

In order to determine if the fish were all growing at the same rate at the three stations, the length of the commonest fish shad and carp were plotted as functions of weight. If station 1 (open squares) were different than station #2(plus) or #3(diamonds), then we might infer that they were growing more or less faster at given lengths. Condition is fattness factor per unit length. This condition is a good indicator of stress by late summer. Although the difference in scattergrams was not compared statistically, the fish from all three stations overlap completely across the spectrum of size and length we caught(Fig. 6a, 6b). The large carp > 1000 gm were not measured at station #1 and appear as a line as an artifact of graphing as a result. Had we obtained larger samples of game fish from each station a more satisfying comparison from the prespective of the fisherperson, might have been attempted. But with the few bass and other predators at all stations no meaningful comparison should be made.

SUMMARY: The fishery in the river has not changed much in the three years of our surveys. The diversity is often highest at station 2, Stickers Grove, because there is no dominance by one species, the gizzard shad or carp. The presence of pools along the river, increases these pool-loving species at stations 1 and 3, Boulton pool and Paddy's Run pool. Density is enhanced at station 3, Paddy's Run pool by the dam which prevents upstream

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migration during low water. Hence numerous fish are trapped below the dam. Moreover, the continual disturbance on on side of the river at that point by gravel mining, releases large numbers of food items from the gravel/silt bottom.

In summary:

1. The highest number of species occured at station #3(16 spp.).

2. The highest diversity per individual, H', a measure of species richness and equitability, was highest at station #2, Strickers Grove.

3. The redundancy (dominance by one species) was higest at station #3, Paddy's Run.

4. Most fish at all stations were in good condition, free from congenital growth defects, lesions, and ectoparasites.

5. The smallest fish on average were collected from stations #3,#2,#1, in that order.

6. Conversely, the largest fish were found at station #1,#2, #3 ,in that order.

7. For the two most numerous fish, gizzard shad and carp, the length/weight curves overlaid each other, meaning that fish condition at all stations was similar. There were more big carp at station #1 (> 1 kg).

LIST OF TABLES AND FIGURES

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Fernald Survey 1986

Table 1: Numbers of fish by family and species electrofished from Great Miami River, 15-16 Sept. 1986 at three station near Westinghouse Materials Company

Family	Code #	Common Name	Species Name	NUMBERS COLLECTED PER STATI 'I'	'II'	'III'
Clupeidae	1	GIZZARD SHAD	Dorosoma cepedianum	17	13	114
Hiodontidae	30	MOONEYE	Hiodon tergisus	0	0	2
Cyprinidae	2	CARP	Cyprinus carpio	31	12	1
Cyprinidae	17	PIMEPAHLES	Pimephales sp.	0	6	0
Castostomidae	13	RIVER CARPSUCKER	Carpiodes carpio	2	8	2
Castostomidae	26	QUILLBACK CARPSUCKER	Carpiodes cyprinus	0	1	1
Castostomidae	12	HIGHFIN CARPSUCKER	Carpiodes velifer	0	2	0
Castostomidae	31	SHORTHEAD REDHORSE	Moxostoma carinatum	0	2	0
Catostomidae	21	GOLDEN REDHORSE	Moxostoma duquesnei	0	5	0
Ictaluridae	32	BROWN BULLHEAD	Ictalurus nebulosus	0	1	0
Ictaluridae	15	CHANNEL CATFISH	Ictalurus punctatus	7	13	2
Percichthyidae	10	WHITE BASS	Marone chrysops	0	0	7
Centrarchidae	9	GREEN SUNFISH	Lepomis cyanellus	2	1	1
Centrarchidae	20	SUNFISH UNIDENT.	Lepomis hybrid unident.	4	0	2
Centrarchidae	5	BLUEGILL SUNFISH	Lepomis macrochirus	0	1	7
Centrarchidae	6	LONGEAR SUNFISH	Lepomis megalotis	3	7	9
Centrarchidae	4	SMALL MOUTH BASS	Micropterus dolomieui	1	0	0
Centrarchidae	19	SPOTTED BASS	Micropterus puntulatus	2	0	0
Centrarchidae	3	LARGE MOUTH BASS	Micropterus salmoides	2	1	16
Centrarchidae	7	WHITE CRAPPIE	Pomoxis annularis	0	0	3
Centrarchidae	29	BLACK CRAPPIE	Pomoxis nigromaculatus	0	0	3
Percidae	11	SAUGER	Stizostedion canadense	0	0	1
Sciaenidae	18	DRUM	Aplodinatus gunniens	2	6	5
	33			1	0	0
	34			0	0	1

		I	II	III
Total Fish Enumerated		74	79	181
DIVERSITY (Ln2)	J =	2.622	3.399	2.197
SPECIES NUMBER	s =	12	15	16
MAXIMAL DIVERSITY POSSIBLE		3.585	3.907	4.000
EVENESS	E =	0.731	0.870	0.549

Figure 1:

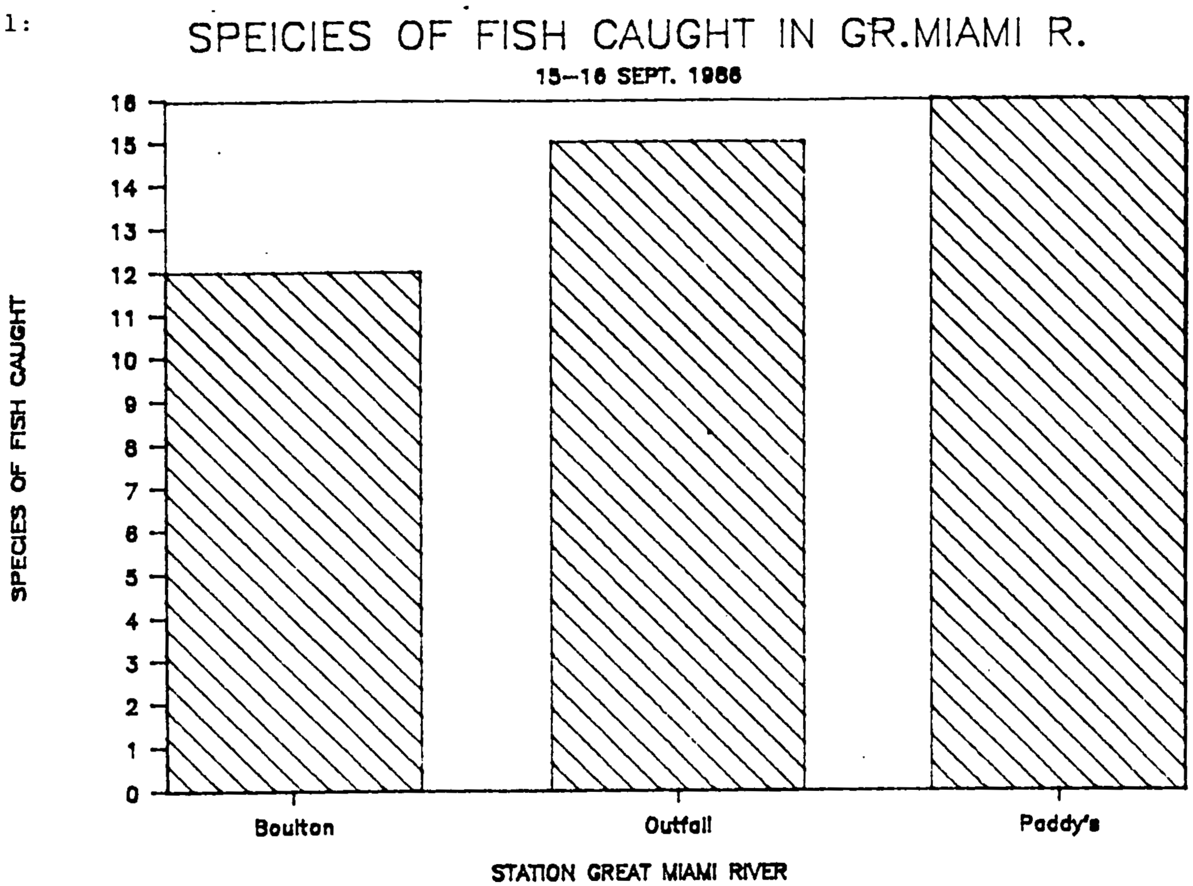

Figure 2:

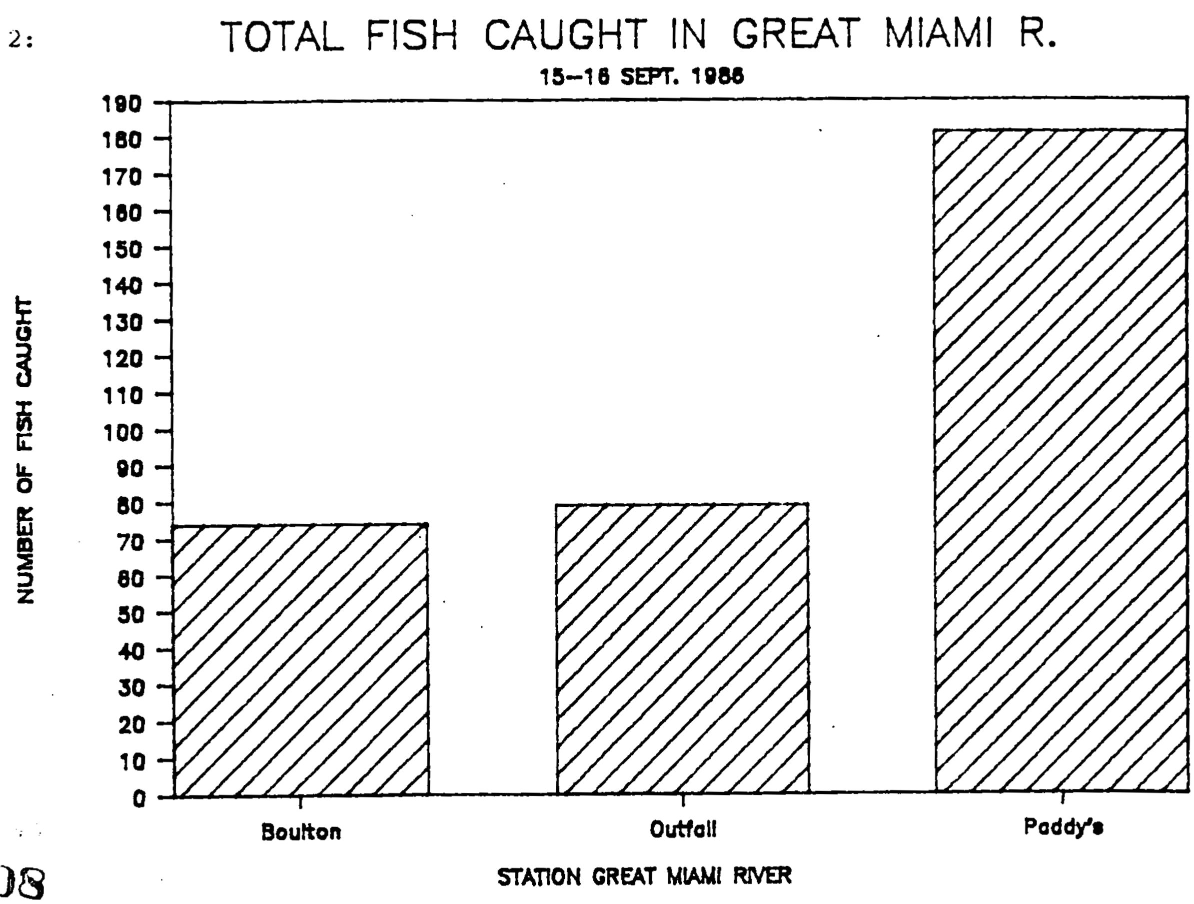

Figure 3:

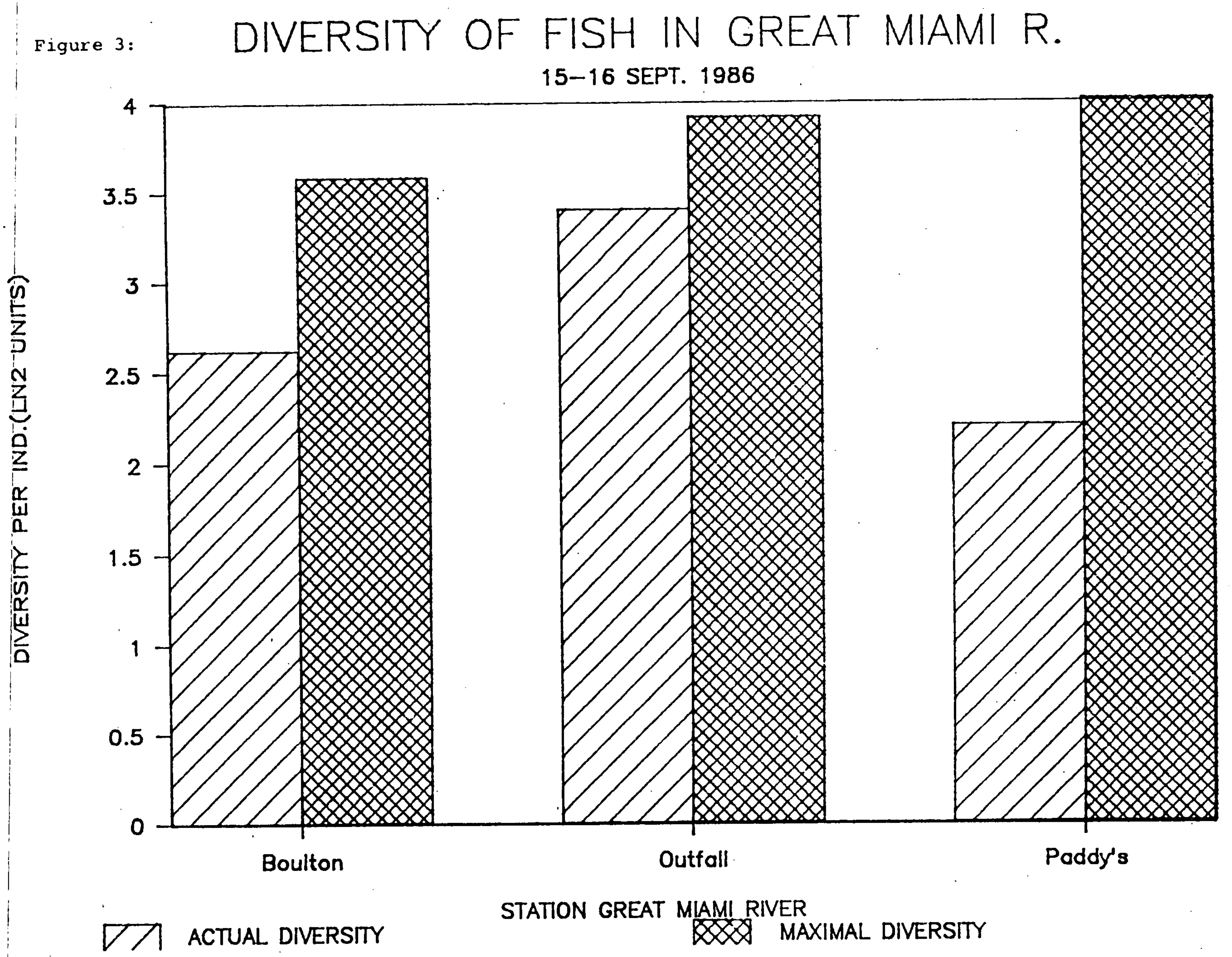
DIVERSITY OF FISH IN GREAT MIAMI R.
15–16 SEPT. 1986
DIVERSITY PER IND. (LN2 UNITS)
4
3.5
3
2.5
2
1.5
1
0.5
0
Boulton
Outfall
Paddy's
STATION GREAT MIAMI RIVER
ACTUAL DIVERSITY
MAXIMAL DIVERSITY

Figure 4a:

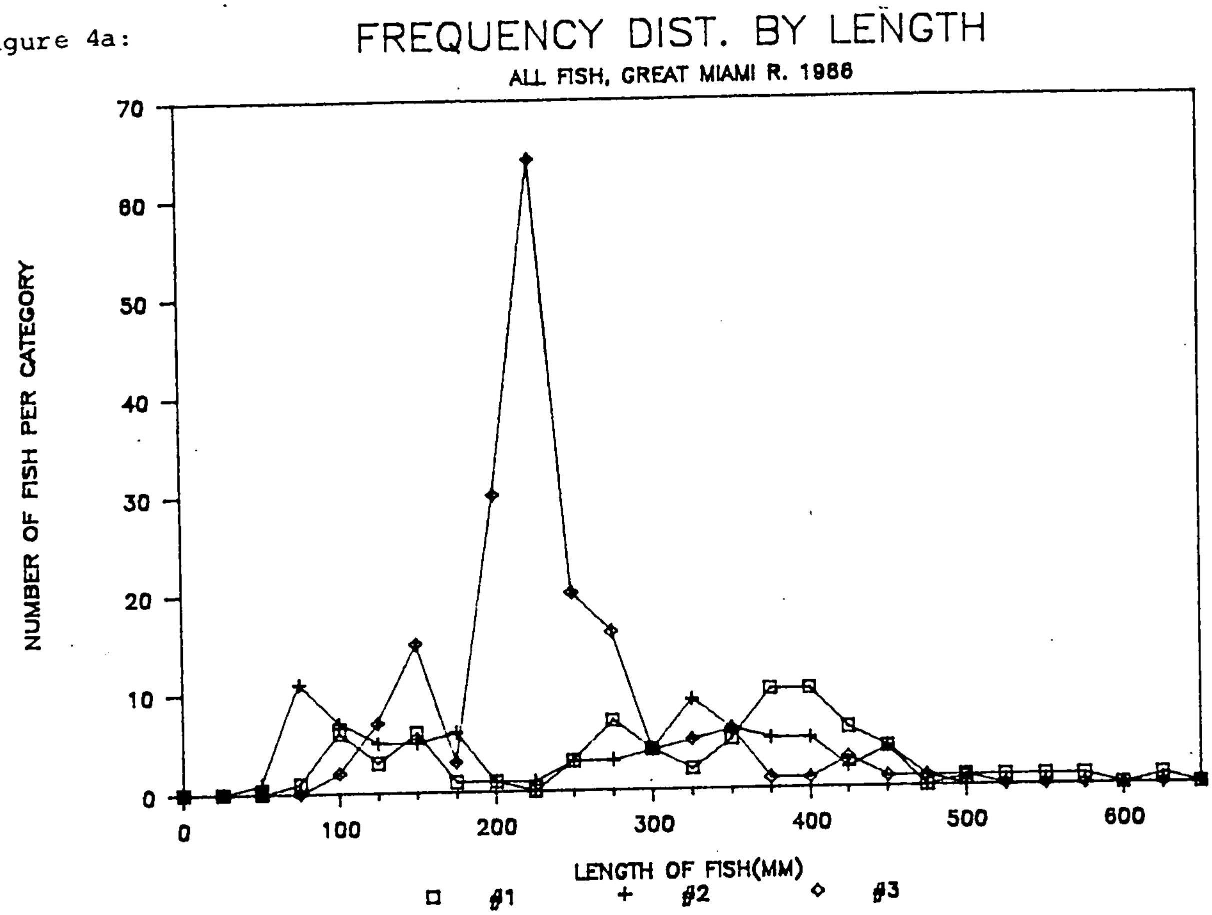

Figure 4b:

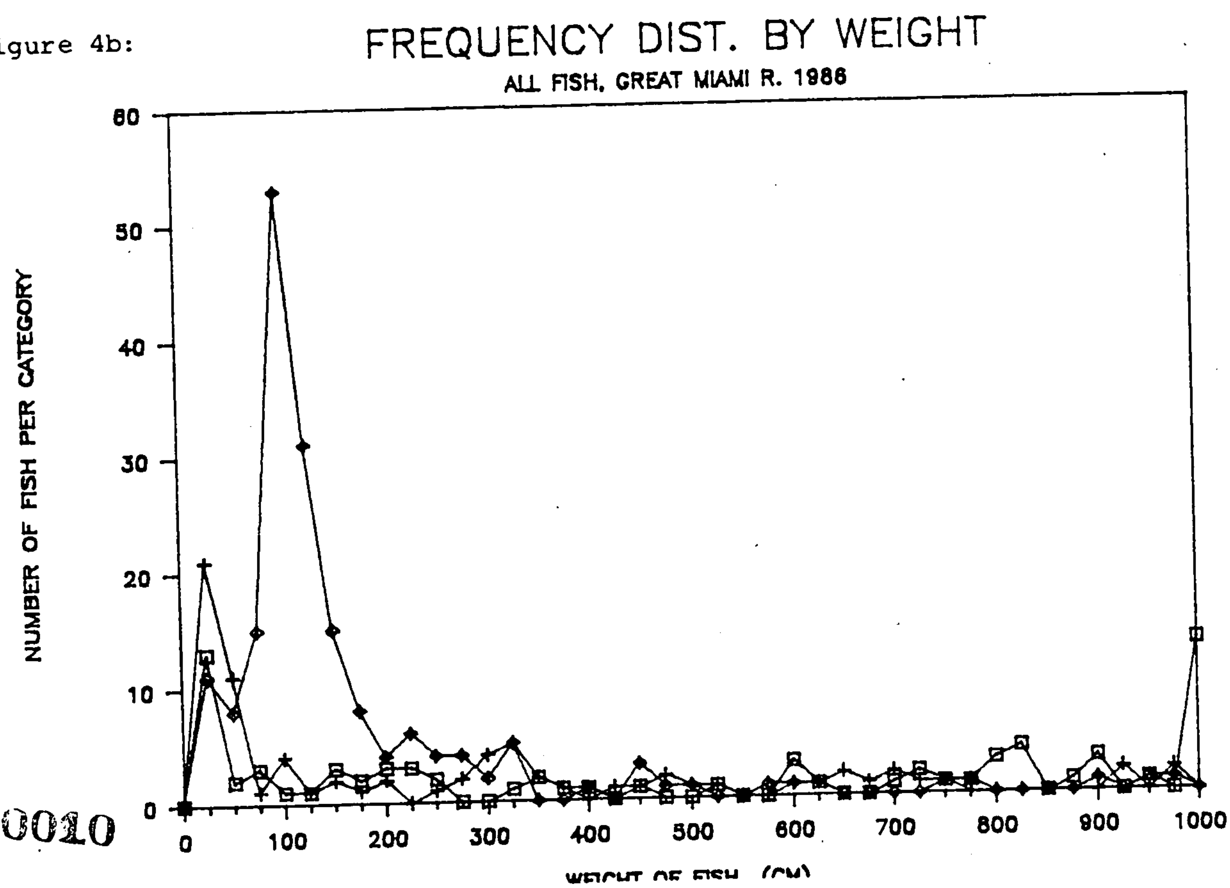

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Figure 5a:

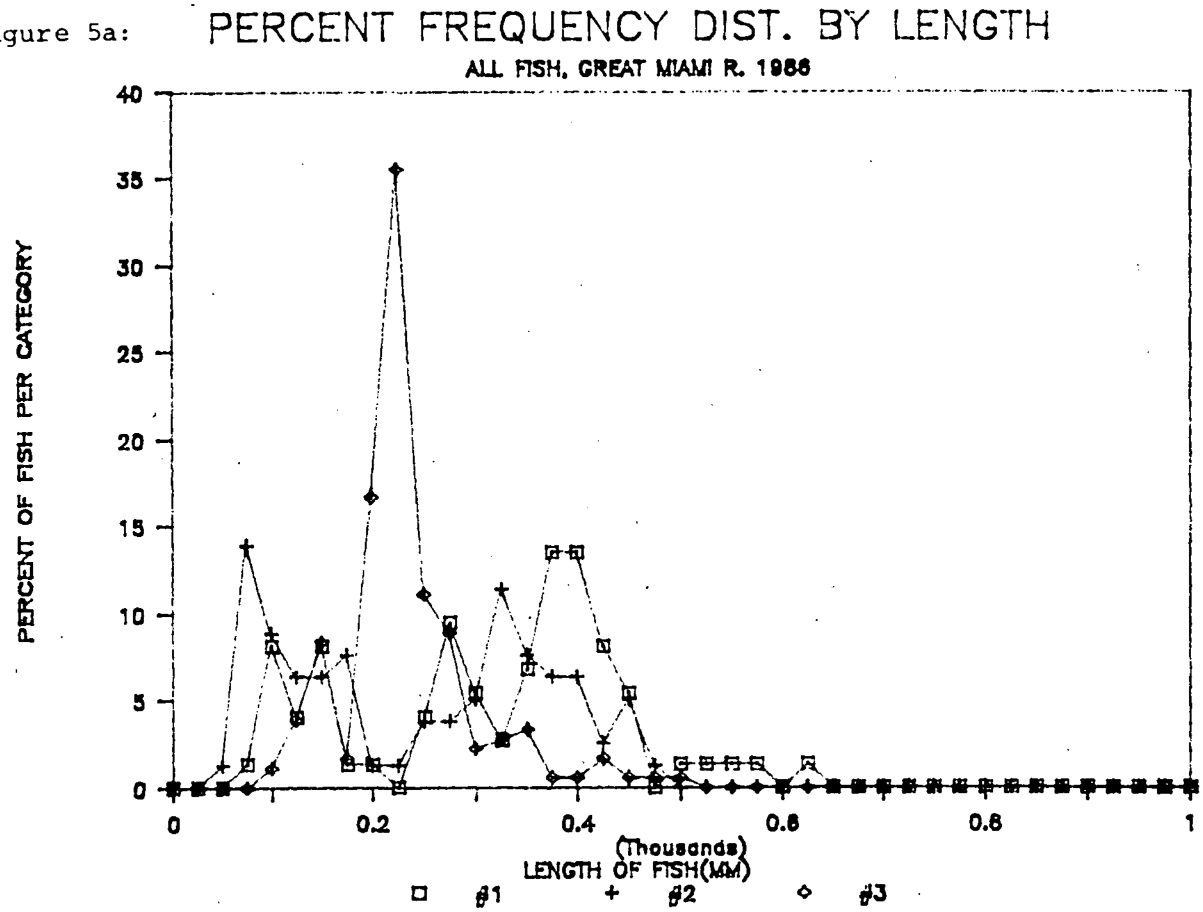

Figure 5b:

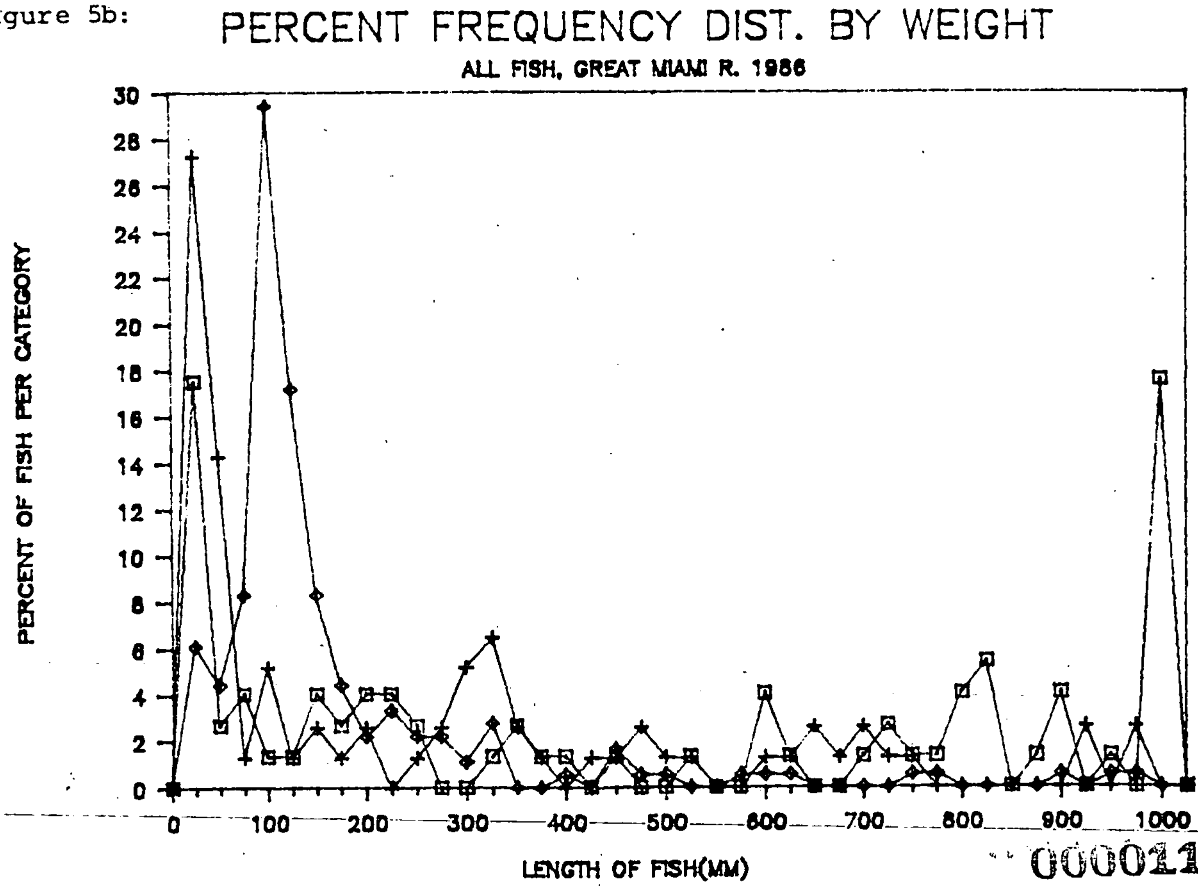

Figure 6a:

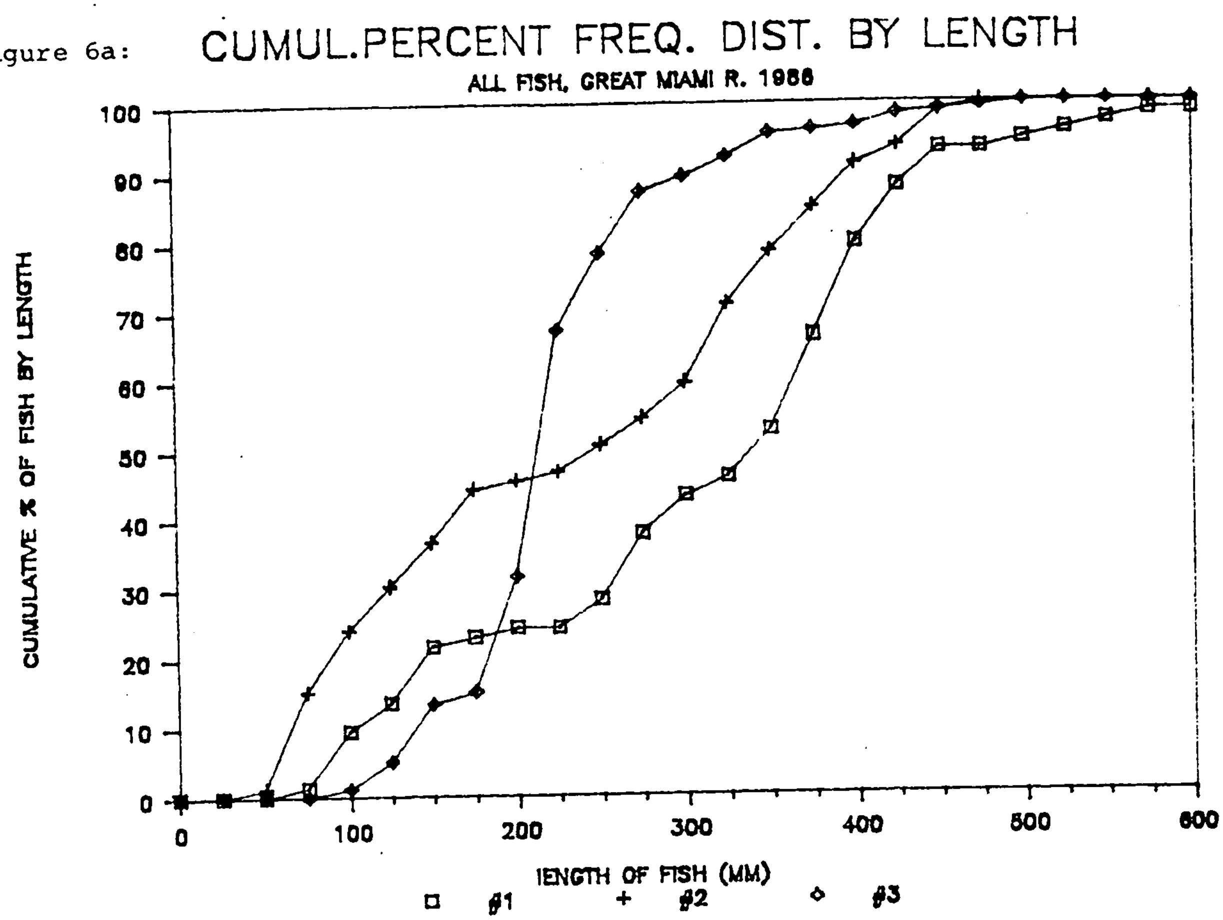

Figure 6b:

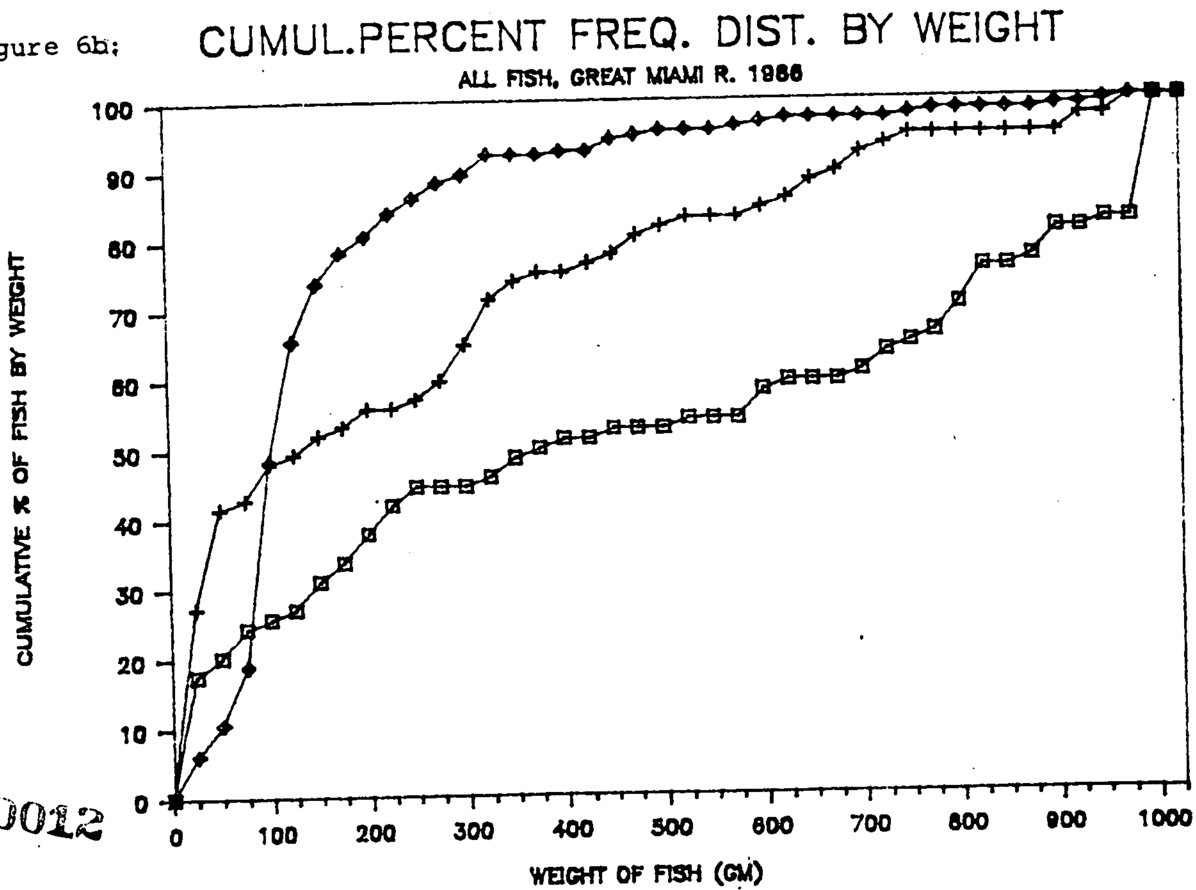

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Figure 7a:

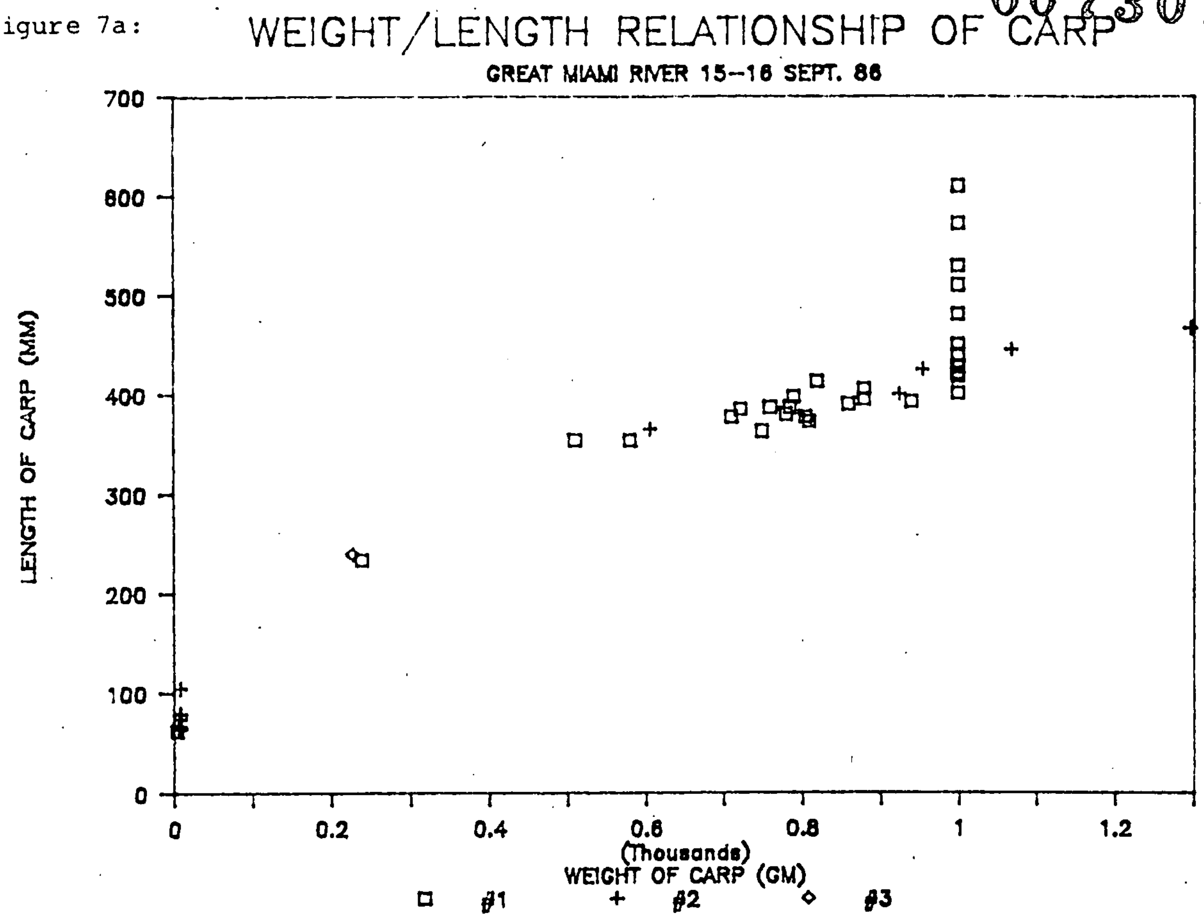

Figure 7b: